1. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 - 25x^2 - 18x + 40}{16x^2 + 32x + 15}$$

A. Holes at $x = -0.75$ and $x = -1.25$ with no vertical asymptotes.

B. Vertical Asymptote of $x = 0.75$ and hole at $x = -1.25$

C. Vertical Asymptotes of $x = -0.75$ and $x = -1.25$ with no holes.

D. Vertical Asymptote of $x = -0.75$ and hole at $x = -1.25$

E. Vertical Asymptotes of $x = -0.75$ and $x = 1.333$ with a hole at $x = -1.25$

2. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{9x^3 - 12x^2 - 20x + 16}{9x^2 - 18x + 8}$$

A. Vertical Asymptote of $x = 1.333$ and hole at $x = 0.667$

B. Holes at $x = 1.333$ and $x = 0.667$ with no vertical asymptotes.

C. Vertical Asymptotes of $x = 1.333$ and $x = 0.667$ with no holes.

D. Vertical Asymptotes of $x = 1.333$ and $x = -1.333$ with a hole at $x = 0.667$

E. Vertical Asymptote of $x = 1.0$ and hole at $x = 0.667$

3. Which of the following functions *could* be the graph below?
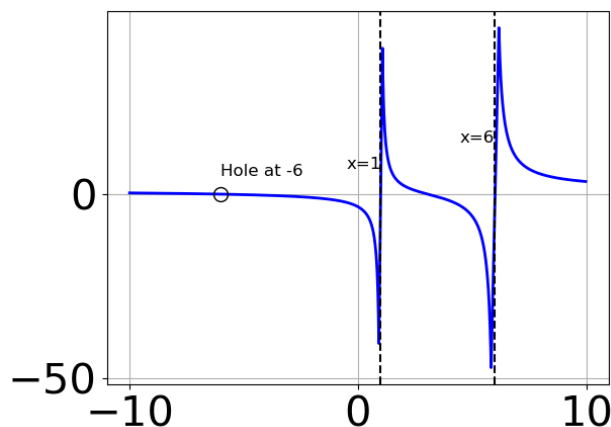
A. $f(x) = \dfrac{x^3 - 37.0x - 84.0}{x^3 + x^2 - 36.0x - 36.0}$

B. $f(x) = \dfrac{x^3 - 37.0x + 84.0}{x^3 - 1.0x^2 - 36.0x + 36.0}$

C. $f(x) = \dfrac{x^3 + 10.0x^2 + 3.0x - 126.0}{x^3 - 1.0x^2 - 36.0x + 36.0}$

D. $f(x) = \dfrac{x^3 - 10.0x^2 + 3.0x + 126.0}{x^3 + x^2 - 36.0x - 36.0}$

E. None of the above are possible equations for the graph.

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4. Determine the horizontal and/or oblique asymptotes in the rational function below.
$$f(x) = \frac{3x^2 + 16x + 16}{9x^3 - 36x^2 - 16x + 64}$$

A. Oblique Asymptote of $y = 3x - 28$.

B. Horizontal Asymptote of $y = 0.333$ and Oblique Asymptote of $y = 3x - 28$

C. Horizontal Asymptote at $y = -4.000$

D. Horizontal Asymptote of $y = 0$

E. Horizontal Asymptote of $y = 0.333$

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5. Which of the following functions *could* be the graph below?
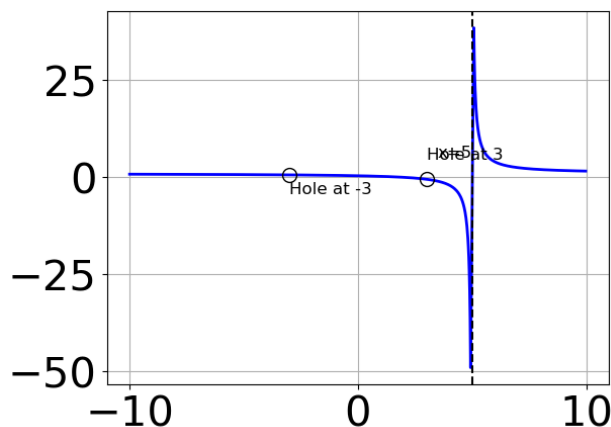
A. $f(x) = \dfrac{x^3 + 7.0x^2 + 4.0x - 12.0}{x^3 + 5.0x^2 - 9.0x - 45.0}$

B. $f(x) = \dfrac{x^3 + 2.0x^2 - 9.0x - 18.0}{x^3 + 5.0x^2 - 9.0x - 45.0}$

C. $f(x) = \dfrac{x^3 + x^2 - 16.0x + 20.0}{x^3 - 5.0x^2 - 9.0x + 45.0}$

D. $f(x) = \dfrac{x^3 - 2.0x^2 - 9.0x + 18.0}{x^3 - 5.0x^2 - 9.0x + 45.0}$

E. None of the above are possible equations for the graph.

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6. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{16x^3 - 72x^2 + 17x + 60}{8x^2 - 14x - 15}$$

A. Vertical Asymptotes of $x = 2.5$ and $x = -0.75$ with no holes.

B. Vertical Asymptotes of $x = 2.5$ and $x = 1.25$ with a hole at $x = -0.75$

C. Vertical Asymptote of $x = 2.0$ and hole at $x = -0.75$

D. Vertical Asymptote of $x = 2.5$ and hole at $x = -0.75$

E. Holes at $x = 2.5$ and $x = -0.75$ with no vertical asymptotes.

7. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{5x^2 - 29x + 20}{20x^3 + 49x^2 - 112x + 48}$$

A. Oblique Asymptote of $y = 4x + 33$.

B. Horizontal Asymptote of $y = 0$

C. Horizontal Asymptote of $y = 0.250$ and Oblique Asymptote of $y = 4x + 33$

D. Horizontal Asymptote of $y = 0.250$

E. Horizontal Asymptote at $y = 5.000$

8. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{8x^3 - 6x^2 - 45x + 50}{12x^2 + 5x - 25}$$

A. Vertical Asymptote of $x = -1.667$ and hole at $x = 1.25$

B. Holes at $x = -1.667$ and $x = 1.25$ with no vertical asymptotes.

C. Vertical Asymptotes of $x = -1.667$ and $x = -2.5$ with a hole at $x = 1.25$

D. Vertical Asymptote of $x = 0.667$ and hole at $x = 1.25$

E. Vertical Asymptotes of $x = -1.667$ and $x = 1.25$ with no holes.

9. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^3 + 11x^2 - x - 6}{2x^2 + 11x + 12}$$

A. Horizontal Asymptote of $y = -4.0$ and Oblique Asymptote of $y = 3x - 11$

B. Horizontal Asymptote of $y = 3.0$ and Oblique Asymptote of $y = 3x - 11$

C. Horizontal Asymptote at $y = -4.0$

D. Oblique Asymptote of $y = 3x - 11$.

E. Horizontal Asymptote of $y = 3.0$

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10. Determine the horizontal and/or oblique asymptotes in the rational function below.
$$f(x) = \frac{6x^3 - 23x^2 - 16x + 48}{3x^2 + 8x - 16}$$

A. Horizontal Asymptote of $y = -4.0$ and Oblique Asymptote of $y = 2x - 13$

B. Horizontal Asymptote at $y = -4.0$

C. Horizontal Asymptote of $y = 2.0$

D. Horizontal Asymptote of $y = 2.0$ and Oblique Asymptote of $y = 2x - 13$

E. Oblique Asymptote of $y = 2x - 13$.

---

11. Determine the vertical asymptotes and holes in the rational function below.
$$f(x) = \frac{9x^3 + 15x^2 - 74x + 40}{9x^2 - 9x - 10}$$

A. Vertical Asymptote of $x = 1.0$ and hole at $x = 1.667$

B. Vertical Asymptotes of $x = -0.667$ and $x = 0.667$ with a hole at $x = 1.667$

C. Holes at $x = -0.667$ and $x = 1.667$ with no vertical asymptotes.

D. Vertical Asymptote of $x = -0.667$ and hole at $x = 1.667$

E. Vertical Asymptotes of $x = -0.667$ and $x = 1.667$ with no holes.

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12. Determine the vertical asymptotes and holes in the rational function

below.

$$f(x) = \frac{6x^3 + 37x^2 + 75x + 50}{8x^2 + 30x + 25}$$

A. Vertical Asymptotes of $x = -1.25$ and $x = -1.667$ with a hole at $x = -2.5$

B. Vertical Asymptotes of $x = -1.25$ and $x = -2.5$ with no holes.

C. Holes at $x = -1.25$ and $x = -2.5$ with no vertical asymptotes.

D. Vertical Asymptote of $x = -1.25$ and hole at $x = -2.5$

E. Vertical Asymptote of $x = 0.75$ and hole at $x = -2.5$

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13. Which of the following functions *could* be the graph below?
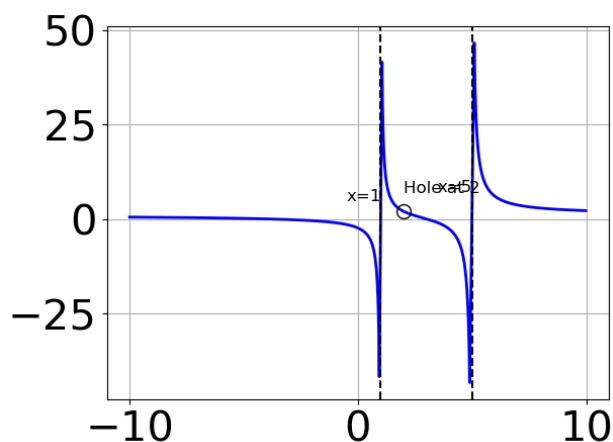
A. $f(x) = \dfrac{x^3 + 5.0x^2 - 18.0x - 72.0}{x^3 + 8.0x^2 + 17.0x + 10.0}$

B. $f(x) = \dfrac{x^3 - 1.0x^2 - 14.0x + 24.0}{x^3 - 8.0x^2 + 17.0x - 10.0}$

C. $f(x) = \dfrac{x^3 + x^2 - 14.0x - 24.0}{x^3 + 8.0x^2 + 17.0x + 10.0}$

D. $f(x) = \dfrac{x^3 + 3.0x^2 - 10.0x - 24.0}{x^3 - 8.0x^2 + 17.0x - 10.0}$
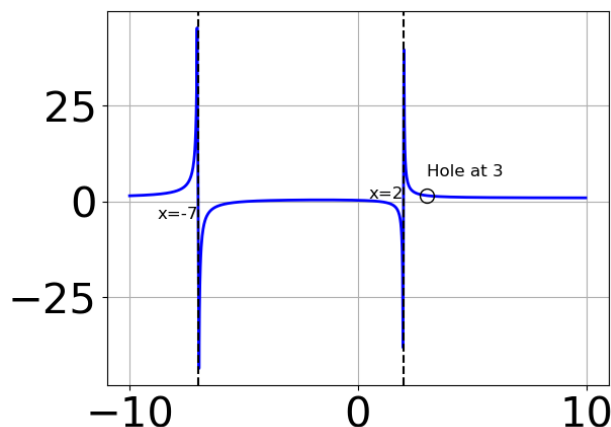
E. None of the above are possible equations for the graph.

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14. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{5x^2 + 23x + 12}{15x^3 - 56x^2 + 21x + 36}$$

A. Horizontal Asymptote of $y = 0.333$ and Oblique Asymptote of $y = 3x - 25$

B. Horizontal Asymptote of $y = 0$

C. Horizontal Asymptote of $y = 0.333$

D. Oblique Asymptote of $y = 3x - 25$.

E. Horizontal Asymptote at $y = -4.000$

15. Which of the following functions *could* be the graph below?

Hole at 3
x=2
x=-7

A. $f(x) = \dfrac{x^3 - 1.0x^2 - 17.0x - 15.0}{x^3 - 2.0x^2 - 29.0x - 42.0}$

B. $f(x) = \dfrac{x^3 + 8.0x^2 + 11.0x - 20.0}{x^3 + 2.0x^2 - 29.0x + 42.0}$

C. $f(x) = \dfrac{x^3 + 2.0x^2 - 29.0x - 30.0}{x^3 - 2.0x^2 - 29.0x - 42.0}$

D. $f(x) = \dfrac{x^3 + x^2 - 17.0x + 15.0}{x^3 + 2.0x^2 - 29.0x + 42.0}$

E. None of the above are possible equations for the graph.

16. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{4x^3 - 16x^2 - 25x + 100}{4x^2 - 4x - 15}$$

A. Vertical Asymptote of $x = 1.0$ and hole at $x = 2.5$

B. Vertical Asymptotes of $x = -1.5$ and $x = 2.5$ with no holes.

C. Holes at $x = -1.5$ and $x = 2.5$ with no vertical asymptotes.

D. Vertical Asymptotes of $x = -1.5$ and $x = -2.5$ with a hole at $x = 2.5$

E. Vertical Asymptote of $x = -1.5$ and hole at $x = 2.5$

17. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{2x^2 + 9x + 10}{12x^3 - 8x^2 - 135x - 100}$$

A. Horizontal Asymptote of $y = 0.167$

B. Horizontal Asymptote at $y = -2.000$

C. Horizontal Asymptote of $y = 0.167$ and Oblique Asymptote of $y = 6x - 31$

D. Oblique Asymptote of $y = 6x - 31$.

E. Horizontal Asymptote of $y = 0$

18. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{16x^3 + 16x^2 - 9x - 9}{8x^2 - 14x - 15}$$

A. Vertical Asymptote of $x = 2.0$ and hole at $x = -0.75$

B. Vertical Asymptotes of $x = 2.5$ and $x = 0.75$ with a hole at $x = -0.75$

C. Holes at $x = 2.5$ and $x = -0.75$ with no vertical asymptotes.

D. Vertical Asymptote of $x = 2.5$ and hole at $x = -0.75$

E. Vertical Asymptotes of $x = 2.5$ and $x = -0.75$ with no holes.

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19. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{16x^3 - 16x^2 - 25x + 25}{4x^2 - 21x + 20}$$

A. Horizontal Asymptote of $y = 4.0$

B. Oblique Asymptote of $y = 4x + 17$.

C. Horizontal Asymptote at $y = 4.0$

D. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 4x + 17$

E. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 4x + 17$

---

20. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{12x^3 + 11x^2 - 45x - 50}{3x^2 - 7x - 20}$$

A. Horizontal Asymptote at $y = 4.0$

B. Oblique Asymptote of $y = 4x + 13$.

C. Horizontal Asymptote of $y = 4.0$

D. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 4x + 13$

E. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 4x + 13$

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21. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{6x^3 - 47x^2 + 112x - 80}{6x^2 + 7x - 20}$$

A. Holes at $x = -2.5$ and $x = 1.333$ with no vertical asymptotes.

B. Vertical Asymptote of $x = -2.5$ and hole at $x = 1.333$

C. Vertical Asymptotes of $x = -2.5$ and $x = 2.5$ with a hole at $x = 1.333$

D. Vertical Asymptotes of $x = -2.5$ and $x = 1.333$ with no holes.

E. Vertical Asymptote of $x = 1.0$ and hole at $x = 1.333$

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22. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{6x^3 + 11x^2 - 20x - 25}{9x^2 - 21x + 10}$$

A. Vertical Asymptote of $x = 0.667$ and hole at $x = 1.667$

B. Vertical Asymptotes of $x = 0.667$ and $x = 1.667$ with no holes.

C. Vertical Asymptote of $x = 0.667$ and hole at $x = 1.667$

D. Holes at $x = 0.667$ and $x = 1.667$ with no vertical asymptotes.

E. Vertical Asymptotes of $x = 0.667$ and $x = -2.5$ with a hole at $x = 1.667$

23. Which of the following functions *could* be the graph below?
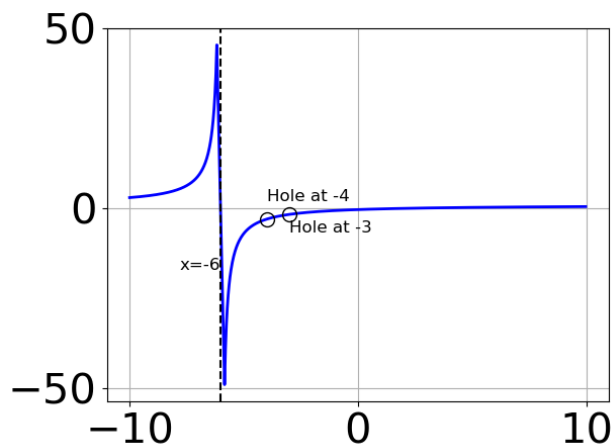
A. $f(x) = \dfrac{x^3 + 5.0x^2 - 2.0x - 24.0}{x^3 + 13.0x^2 + 54.0x + 72.0}$

B. $f(x) = \dfrac{x^3 - 1.0x^2 - 16.0x - 20.0}{x^3 - 13.0x^2 + 54.0x - 72.0}$

C. $f(x) = \dfrac{x^3 - 1.0x^2 - 22.0x + 40.0}{x^3 + 13.0x^2 + 54.0x + 72.0}$

D. $f(x) = \dfrac{x^3 - 5.0x^2 - 2.0x + 24.0}{x^3 - 13.0x^2 + 54.0x - 72.0}$

E. None of the above are possible equations for the graph.

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24. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{20x^3 - 47x^2 - 54x + 45}{-20x^3 + 14x^2 - 18}$$

A. Vertical Asymptote of $y = 3$

B. Vertical Asymptote of $y = -0.500$

C. None of the above

D. Horizontal Asymptote of $y = 0$

E. Horizontal Asymptote of $y = -1.000$

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25. Which of the following functions *could* be the graph below?
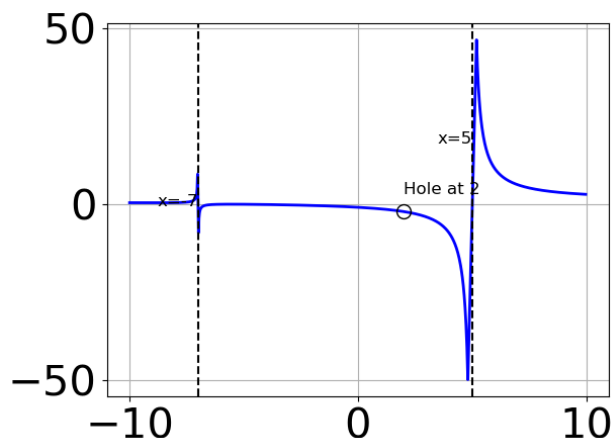
A. $f(x) = \dfrac{x^3 - 5.0x^2 - 36.0x + 180.0}{x^3 - 39.0x - 70.0}$

B. $f(x) = \dfrac{x^3 + 13.0x^2 + 52.0x + 60.0}{x^3 - 39.0x + 70.0}$

C. $f(x) = \dfrac{x^3 + 9.0x^2 + 8.0x - 60.0}{x^3 - 39.0x + 70.0}$

D. $f(x) = \dfrac{x^3 - 9.0x^2 + 8.0x + 60.0}{x^3 - 39.0x - 70.0}$

E. None of the above are possible equations for the graph.

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26. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{9x^3 - 9x^2 - 88x - 80}{9x^2 + 9x - 10}$$

A. Vertical Asymptotes of $x = 0.667$ and $x = -1.333$ with a hole at $x = -1.667$

B. Vertical Asymptote of $x = 0.667$ and hole at $x = -1.667$

C. Vertical Asymptote of $x = 1.0$ and hole at $x = -1.667$

D. Vertical Asymptotes of $x = 0.667$ and $x = -1.667$ with no holes.

E. Holes at $x = 0.667$ and $x = -1.667$ with no vertical asymptotes.

27. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{10x^3 - 13x^2 - 46x + 40}{-10x^3 + 46x^2 + 52x + 20}$$

   A. Vertical Asymptote of $y = -0.400$

   B. Vertical Asymptote of $y = -2$

   C. Horizontal Asymptote of $y = -1.000$

   D. Horizontal Asymptote of $y = 0$

   E. None of the above

28. Determine the vertical asymptotes and holes in the rational function below.
$$f(x) = \frac{12x^3 - 17x^2 - 104x - 80}{9x^2 + 6x - 8}$$

   A. Vertical Asymptotes of $x = 0.667$ and $x = -1.25$ with a hole at $x = -1.333$

   B. Holes at $x = 0.667$ and $x = -1.333$ with no vertical asymptotes.

   C. Vertical Asymptotes of $x = 0.667$ and $x = -1.333$ with no holes.

   D. Vertical Asymptote of $x = 1.333$ and hole at $x = -1.333$

   E. Vertical Asymptote of $x = 0.667$ and hole at $x = -1.333$

29. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^3 - 49x^2 + 125x - 100}{2x^2 + 3x - 20}$$

   A. Horizontal Asymptote at $y = -4.0$

   B. Horizontal Asymptote of $y = 3.0$

   C. Oblique Asymptote of $y = 3x - 29$.

D. Horizontal Asymptote of $y = 3.0$ and Oblique Asymptote of $y = 3x - 29$

E. Horizontal Asymptote of $y = -4.0$ and Oblique Asymptote of $y = 3x - 29$

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30. Determine the horizontal and/or oblique asymptotes in the rational function below.
$$f(x) = \frac{12x^3 - 29x^2 + 23x - 6}{3x^2 + 10x - 8}$$

A. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 4x - 23$

B. Horizontal Asymptote of $y = -4.0$ and Oblique Asymptote of $y = 4x - 23$

C. Horizontal Asymptote of $y = 4.0$

D. Horizontal Asymptote at $y = -4.0$

E. Oblique Asymptote of $y = 4x - 23$.